

Hydrogen and Methane Fermentation of Solid Wastes from Food Industry

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Summary

To treat and recover energy from food industrial solid wastes, methane fermentation is very attractive. In this article, therefore, researches on methane fermentation of solid wastes from a Japanese Sake brewery, bread manufacture, and soy sauce brewery were reviewed. To solubilize and acidify the waste from a Japanese Sake brewery, hyperthermophilic archaeon *Pyrococcus furiosus* could be applied. A perfusion culture developed to increase cell concentration gave 0.4 g/l/h of acetate production rate from rice powder. Furthermore, a continuous culture using the cells fixed on a porous ceramic carrier gave 0.14 g/l/h of acetate production rate at the dilution rate of 0.4 h⁻¹. By using a microbial consortium, when 100 g-wet wt./l of the bread waste was fermented under controlled pH 7 conditions, 91% SS was reduced after 24 h and 240 mM H₂ was produced. When the diluted culture broth after the hydrogen fermentation was supplied continuously into a UASB methanogenic reactor, the optimum loading of 9.5 g-TOC/l/day gave 80% TOC removal, 408 mmol/l/day of methane production rate and ca. 0.6 methane yield as carbon base. To reduce MLSS in soy sauce refuse (SSR) and produce methane successfully, thermophilic methanogenic sludge obtained from a municipal wastewater treatment plant could be used as seed. At 25 g-wet wt./l of SSR, 120 mM CH₄ production and 50% (w/v) MLSS reduction were observed after 35 d. Acclimatization of the sludge to the waste was effective to increase the methane production rate in the pH-controlled fed-batch culture using the stirred tank reactor. Development of high rate production of hydrogen-methane in two-stage process was also discussed.